

## Dual-Bit, Dual Supply Voltage Level Translator/Transceiver; 3-State

### General Description

The ET74AVCH2T45 is a dual-bit, dual-supply transceiver that enables bidirectional level translation. It features two data input-output ports (nA and nB), a direction control input (DIR) and dual-supply pins (VCC(A) and VCC(B)). Both VCC(A) and VCC(B) can be supplied at any voltage between 0.8V and 3.6V making the device suitable for translating between any of the low voltage nodes (0.8V, 1.2V, 1.8V and 3.3V). Pins nA and DIR are referenced to VCC(A) and pins nB are referenced to VCC(B). A HIGH on DIR allows transmission from nA to nB and a LOW on DIR allows transmission from nB to nA.

The device is fully specified for partial power-down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing any damaging backflow current through the device when it is powered down. In Suspend mode when either VCC(A) or VCC(B) are at GND level, both A and B are in the high-impedance OFF-state.

The ET74AVCH2T45 has active bus hold circuitry which is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors.

### Features

- Wide Supply Voltage Range:
  - V<sub>CC(A)</sub>: 0.8V to 3.6V
  - V<sub>CC(B)</sub>: 0.8V to 3.6V
- High Noise Immunity
- Maximum Data Rates:
  - 500Mbit/s (1.8V to 3.3V Translation)
  - 320Mbit/s (<1.8V to 3.3V Translation)
  - 320Mbit/s (Translate to 2.5V or 1.8V)
  - 280Mbit/s (Translate to 1.5V)
  - 240Mbit/s (Translate to 1.2V)
- Bus Hold on Data Inputs
- Suspend Mode
- Inputs Accept Voltages up to 3.6V
- Low Noise Overshoot and Undershoot < 10% of V<sub>CC</sub>
- IOFF Circuitry Provides Partial Power-down Mode Operation
- ESD Protection Complies with JESD22 Standard
  - HBM: ±4000V Pass (JEDEC JS-001)
  - CDM: ±1500V Pass (JEDEC JS-002)
- Latch-up Performance Exceeds ±100mA per JEDEC JESD78F
- Part No. and Package Information

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| Part No.       | Package                 | Packing option         | MSL     |
|----------------|-------------------------|------------------------|---------|
| ET74AVCH2T45V  | TSSOP8 (4.4mm × 2.95mm) | Tape and Reel, 4K/Reel | Level 3 |
| ET74AVCH2T45U  | MSOP8 (3.0mm × 3.0mm)   | Tape and Reel, 4K/Reel | Level 3 |
| ET74AVCH2T45U1 | VSSOP8 (2.0mm × 2.3mm)  | Tape and Reel, 4K/Reel | Level 3 |

## Applications

- Personal Electronic
- Industrial Equipment
- Enterprise Infrastructure
- Telecom Equipment

## Pin Configuration

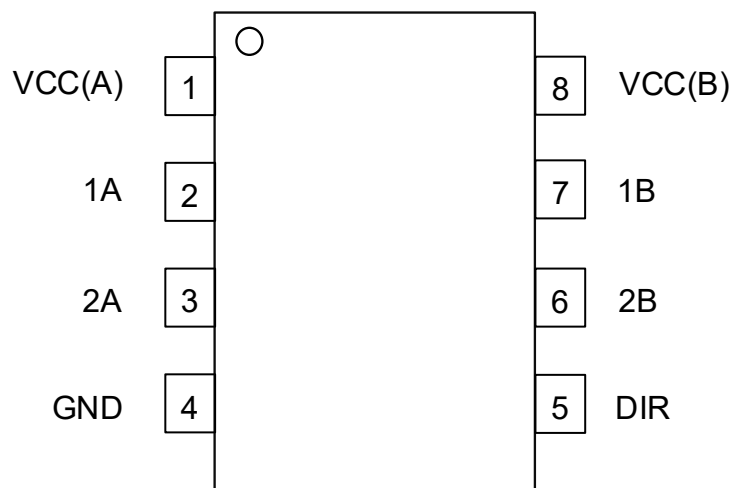


Figure1. Pin Configuration

# ET74AVCH2T45

## Pin Function

| Pin      |            | I/O | Description                                                     |
|----------|------------|-----|-----------------------------------------------------------------|
| Pin Name | Pin Number |     |                                                                 |
| VCC(A)   | 1          | –   | Supply Voltage Pin of A Side (Referenced to Pin 1A, 2A and DIR) |
| 1A       | 2          | I/O | Data Input or Output                                            |
| 2A       | 3          | I/O | Data Input or Output                                            |
| GND      | 4          | –   | Ground (0V)                                                     |
| DIR      | 5          | I   | Direction Control                                               |
| 2B       | 6          | I/O | Data Input or Output                                            |
| 1B       | 7          | I/O | Data Input or Output                                            |
| VCC(B)   | 8          | –   | Supply Voltage Pin of B Side (Referenced to Pin 1B and 2B)      |

## Functional Diagram

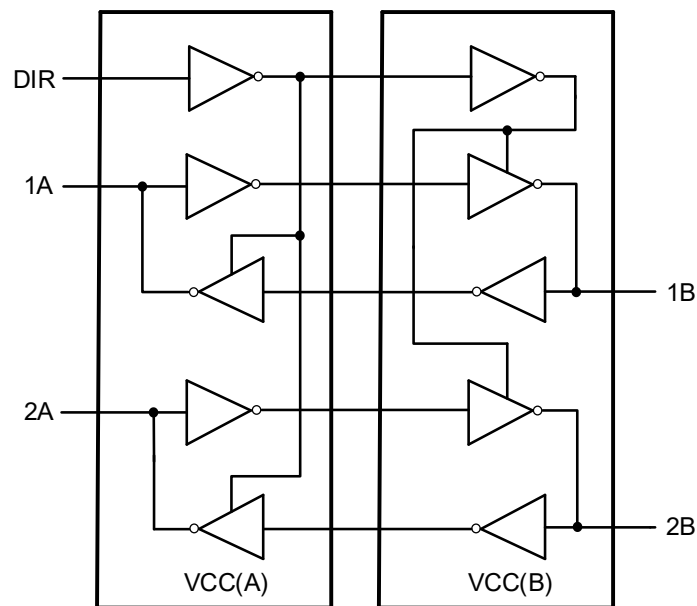


Figure2. Logic symbol

# ET74AVCH2T45

## Functional Description

Function table

| Supply Voltage            | Input              | Input/Output <sup>(1)</sup> |         |
|---------------------------|--------------------|-----------------------------|---------|
| $V_{CC(A)}$ , $V_{CC(B)}$ | DIR <sup>(2)</sup> | nA                          | nB      |
| 0.8V to 3.6V              | L                  | nA = nB                     | Input   |
| 0.8V to 3.6V              | H                  | Input                       | nB = nA |
| GND <sup>(3)</sup>        | X                  | Hi-Z                        | Hi-Z    |

**Note1:** The input circuit of the data I/O is always active.

**Note2:** The DIR input circuit is referenced to VCC(A).

**Note3:** If at least one of VCC(A) or VCC(B) is at GND level, the device goes into suspend mode.

## Absolute Maximum Ratings

| Symbol       | Parameter                          | Conditions                             | Value                     | Unit |
|--------------|------------------------------------|----------------------------------------|---------------------------|------|
| $V_{CC(A)}$  | Supply Voltage A Side (VCC(A) Pin) |                                        | -0.5~4.6                  | V    |
| $V_{CC(B)}$  | Supply Voltage B Side (VCC(B) Pin) |                                        | -0.5~4.6                  | V    |
| $I_{IK}$     | Input Clamping Current             | $V_I < 0V$                             | -50                       | mA   |
| $V_I$        | Input Voltage <sup>(4)</sup>       |                                        | -0.5~4.6                  | V    |
| $I_{OK}$     | Output Clamping Current            | $V_O < 0V$                             | -50                       | mA   |
| $V_O$        | Output Voltage                     | Active Mode <sup>(4)(5)(6)</sup>       | $-0.5 \sim V_{CCO} + 0.5$ | V    |
|              |                                    | Suspend or 3-state Mode <sup>(4)</sup> | -0.5~4.6                  |      |
| $I_O$        | Output Current                     | $V_O = 0V$ to $V_{CCO}$                | $\pm 50$                  | mA   |
| $I_{CC}$     | Supply Current                     | Per VCC(A) or VCC(B) Pin               | 100                       | mA   |
| $I_{GND}$    | Ground Current                     | Per GND Pin                            | -100                      | mA   |
| $T_{J(MAX)}$ | Maximum Junction Temperature       |                                        | 150                       | °C   |
| $T_{STG}$    | Storage Temperature                |                                        | -65~150                   | °C   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**Note4:** The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.

**Note5:**  $V_{CCO} + 0.5V$  should not exceed 4.6V.

**Note6:**  $V_{CCO}$  is the supply voltage associated with the output port.

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## Recommended Operating Conditions

| Symbol              | Parameter                          | Conditions                              | Min | Max       | Unit |
|---------------------|------------------------------------|-----------------------------------------|-----|-----------|------|
| $V_{CC(A)}$         | Supply Voltage A Side (VCC(A) Pin) |                                         | 0.8 | 3.6       | V    |
| $V_{CC(B)}$         | Supply Voltage B Side (VCC(B) Pin) |                                         | 0.8 | 3.6       |      |
| $V_I$               | Input Voltage                      |                                         | 0   | 3.6       | V    |
| $V_O$               | Output Voltage                     | Active State <sup>(6)</sup>             | 0   | $V_{CCO}$ | V    |
|                     |                                    | Suspend or 3-State                      | 0   | 3.6       |      |
| $T_A$               | Ambient Temperature                |                                         | -40 | 125       | °C   |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate | $V_{CCI}$ <sup>(7)</sup> = 0.8V to 3.6V |     | 5         | ns/V |

**Note7:**  $V_{CCI}$  is the supply voltage associated with the input port.

## Electrical Characteristics

Typical static characteristics at  $T_A = 25^\circ\text{C}$  (Unless otherwise noted)<sup>(6)(7)</sup>

| Symbol                        | Parameter                       | Conditions                                                                                                                    | Min | Typ         | Max        | Unit          |
|-------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----|-------------|------------|---------------|
| $V_{OH}$                      | High-level Output Voltage       | $V_I = V_{IH}$ or $V_{IL}$<br>$I_O = -1.5\text{mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$                                   |     | 0.69        |            | V             |
| $V_{OL}$                      | Low-level Output Voltage        | $V_I = V_{IH}$ or $V_{IL}$<br>$I_O = 1.5\text{mA}$ ; $V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$                                    |     | 0.07        |            | V             |
| $I_I$                         | Input Leakage Current           | DIR Input; $V_I = 0\text{V}$ or $3.6\text{V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$ to $3.6\text{V}$                     |     | $\pm 0.025$ | $\pm 0.25$ | $\mu\text{A}$ |
| $I_{BHL}$ <sup>(8)</sup>      | Bus Hold LOW Current            | A or B port; $V_I = 0.42\text{V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$                                                  |     | 26          |            | $\mu\text{A}$ |
| $I_{BHH}$ <sup>(8)</sup>      | Bus Hold HIGH Current           | A or B port; $V_I = 0.78\text{V}$ ;<br>$V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$                                                  |     | -24         |            | $\mu\text{A}$ |
| $I_{BHLO}$ <sup>(8) (9)</sup> | Bus Hold LOW Overdrive Current  | $V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$                                                                                         |     | 27          |            | $\mu\text{A}$ |
| $I_{BHLO}$ <sup>(8) (9)</sup> | Bus Hold HIGH Overdrive Current | $V_{CC(A)} = V_{CC(B)} = 1.2\text{V}$                                                                                         |     | -26         |            | $\mu\text{A}$ |
| $I_{OZ}$                      | Off-state Output Current        | A or B Port; $V_O = 0\text{V}$ or $V_{CCO}$ ; <sup>(6)(10)</sup><br>$V_{CC(A)} = V_{CC(B)} = 0.8\text{V}$ to $3.6\text{V}$    |     | $\pm 0.5$   | $\pm 2.5$  | $\mu\text{A}$ |
| $I_{OFF}$                     | Power-off Leakage Current       | A Port; $V_I$ or $V_O = 0\text{V}$ to $3.6\text{V}$ ;<br>$V_{CC(A)} = 0\text{V}$ ; $V_{CC(B)} = 0.8\text{V}$ to $3.6\text{V}$ |     | $\pm 0.1$   | $\pm 1$    | $\mu\text{A}$ |
|                               |                                 | B Port; $V_I$ or $V_O = 0\text{V}$ to $3.6\text{V}$ ;<br>$V_{CC(B)} = 0\text{V}$ ; $V_{CC(A)} = 0.8\text{V}$ to $3.6\text{V}$ |     | $\pm 0.1$   | $\pm 1$    | $\mu\text{A}$ |
| $C_I$                         | Input Capacitance               | DIR Input; $V_I = 0\text{V}$ or $3.3\text{V}$ ;<br>$V_{CC(B)} = V_{CC(A)} = 3.3\text{V}$                                      |     | 1.0         |            | pF            |
| $C_{I/O}$                     | Input/Output Capacitance        | A and B Port; $V_O = V_{CCO}$ or GND;<br>$V_{CC(A)} = V_{CC(B)} = 3.3\text{V}$                                                |     | 4.0         |            | pF            |

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## Electrical Characteristics(continued)

Static characteristics<sup>(6)(7)</sup>

| Symbol          | Parameter                 | Conditions                                                                              | T <sub>A</sub> = -40°C to 85°C |                        | T <sub>A</sub> = -40°C to 125°C |                        | Unit |
|-----------------|---------------------------|-----------------------------------------------------------------------------------------|--------------------------------|------------------------|---------------------------------|------------------------|------|
|                 |                           |                                                                                         | Min                            | Max                    | Min                             | Max                    |      |
| V <sub>IH</sub> | High-level Input Voltage  | Data Input <sup>(7)</sup>                                                               |                                |                        |                                 |                        |      |
|                 |                           | V <sub>CCI</sub> = 0.8V                                                                 | 0.7V <sub>CCI</sub>            |                        | 0.7V <sub>CCI</sub>             |                        | V    |
|                 |                           | V <sub>CCI</sub> = 1.1V to 1.95V                                                        | 0.65V <sub>CCI</sub>           |                        | 0.65V <sub>CCI</sub>            |                        |      |
|                 |                           | V <sub>CCI</sub> = 2.3V to 2.7V                                                         | 1.6                            |                        | 1.6                             |                        |      |
|                 |                           | V <sub>CCI</sub> = 3.0V to 3.6V                                                         | 2.0                            |                        | 2.0                             |                        |      |
|                 |                           | DIR Input                                                                               |                                |                        |                                 |                        | V    |
|                 |                           | V <sub>CC(A)</sub> = 0.8V                                                               | 0.7V <sub>CC(A)</sub>          |                        | 0.7V <sub>CC(A)</sub>           |                        |      |
|                 |                           | V <sub>CC(A)</sub> = 1.1V to 1.95V                                                      | 0.65V <sub>CC(A)</sub>         |                        | 0.65V <sub>CC(A)</sub>          |                        |      |
|                 |                           | V <sub>CC(A)</sub> = 2.3V to 2.7V                                                       | 1.6                            |                        | 1.6                             |                        |      |
|                 |                           | V <sub>CC(A)</sub> = 3.0V to 3.6V                                                       | 2.0                            |                        | 2.0                             |                        |      |
| V <sub>IL</sub> | Low-level Input Voltage   | Data Input <sup>(7)</sup>                                                               |                                |                        |                                 |                        |      |
|                 |                           | V <sub>CCI</sub> = 0.8V                                                                 |                                | 0.3V <sub>CCI</sub>    |                                 | 0.3V <sub>CCI</sub>    | V    |
|                 |                           | V <sub>CCI</sub> = 1.1V to 1.95V                                                        |                                | 0.35V <sub>CCI</sub>   |                                 | 0.35V <sub>CCI</sub>   |      |
|                 |                           | V <sub>CCI</sub> = 2.3V to 2.7V                                                         |                                | 0.7                    |                                 | 0.7                    |      |
|                 |                           | V <sub>CCI</sub> = 3.0V to 3.6V                                                         |                                | 0.9                    |                                 | 0.9                    |      |
|                 |                           | DIR Input                                                                               |                                |                        |                                 |                        | V    |
|                 |                           | V <sub>CC(A)</sub> = 0.8V                                                               |                                | 0.3V <sub>CC(A)</sub>  |                                 | 0.3V <sub>CC(A)</sub>  |      |
|                 |                           | V <sub>CC(A)</sub> = 1.1V to 1.95V                                                      |                                | 0.35V <sub>CC(A)</sub> |                                 | 0.35V <sub>CC(A)</sub> |      |
|                 |                           | V <sub>CC(A)</sub> = 2.3V to 2.7V                                                       |                                | 0.7                    |                                 | 0.7                    |      |
|                 |                           | V <sub>CC(A)</sub> = 3.0V to 3.6V                                                       |                                | 0.9                    |                                 | 0.9                    |      |
| V <sub>OH</sub> | High-level Output Voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <sup>(8)</sup>                      |                                |                        |                                 |                        |      |
|                 |                           | I <sub>O</sub> = -100μA<br>V <sub>CC(A)</sub> =<br>V <sub>CC(B)</sub> = 0.8V<br>to 3.6V | V <sub>CCO</sub> -0.1          |                        | V <sub>CCO</sub> -0.1           |                        | V    |
|                 |                           | I <sub>O</sub> = -3mA<br>V <sub>CC(A)</sub> =<br>V <sub>CC(B)</sub> = 1.2V              | 0.85                           |                        | 0.85                            |                        |      |
|                 |                           | I <sub>O</sub> = -6mA<br>V <sub>CC(A)</sub> =<br>V <sub>CC(B)</sub> = 1.4V              | 1.05                           |                        | 1.05                            |                        |      |
|                 |                           | I <sub>O</sub> = -8mA<br>V <sub>CC(A)</sub> =<br>V <sub>CC(B)</sub> = 1.65V             | 1.2                            |                        | 1.2                             |                        |      |
|                 |                           | I <sub>O</sub> = -9mA<br>V <sub>CC(A)</sub> =<br>V <sub>CC(B)</sub> = 2.3V              | 1.75                           |                        | 1.75                            |                        |      |
|                 |                           | I <sub>O</sub> = -12mA<br>V <sub>CC(A)</sub> =<br>V <sub>CC(B)</sub> = 3.0V             | 2.3                            |                        | 2.3                             |                        |      |

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## Electrical Characteristics(continued)

| Symbol                          | Parameter                | Conditions                                          |                                                           | T <sub>A</sub> = -40°C to 85°C |      | T <sub>A</sub> = -40°C to 125°C |      | Unit |
|---------------------------------|--------------------------|-----------------------------------------------------|-----------------------------------------------------------|--------------------------------|------|---------------------------------|------|------|
|                                 |                          |                                                     |                                                           | Min                            | Max  | Min                             | Max  |      |
| V <sub>OL</sub>                 | Low-level Output Voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> |                                                           |                                |      |                                 |      |      |
|                                 |                          | I <sub>O</sub> = 100μA                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 0.8V to 3.6V |                                | 0.1  |                                 | 0.1  | V    |
|                                 |                          | I <sub>O</sub> = 3mA                                | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 1.2V         |                                | 0.25 |                                 | 0.25 |      |
|                                 |                          | I <sub>O</sub> = 6mA                                | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 1.4V         |                                | 0.35 |                                 | 0.35 |      |
|                                 |                          | I <sub>O</sub> = 8mA                                | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 1.65V        |                                | 0.45 |                                 | 0.45 |      |
|                                 |                          | I <sub>O</sub> = 9mA                                | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 2.3V         |                                | 0.55 |                                 | 0.55 |      |
|                                 |                          | I <sub>O</sub> = 12mA                               | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 3.0V         |                                | 0.7  |                                 | 0.7  |      |
| I <sub>I</sub>                  | Input Leakage Current    | DIR Input; V <sub>I</sub> = 0V or 3.6V              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 0.8V to 3.6V |                                | ±1   |                                 | ±1.5 | μA   |
| I <sub>BHL</sub> <sup>(8)</sup> | Bus Hold LOW Current     | A or B Port                                         |                                                           |                                |      |                                 |      |      |
|                                 |                          | V <sub>I</sub> = 0.49V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 1.4V         | 15                             |      | 15                              |      | μA   |
|                                 |                          | V <sub>I</sub> = 0.58V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 1.65V        | 25                             |      | 25                              |      | μA   |
|                                 |                          | V <sub>I</sub> = 0.70V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 2.3V         | 45                             |      | 45                              |      | μA   |
|                                 |                          | V <sub>I</sub> = 0.80V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 3.3V         | 100                            |      | 90                              |      | μA   |
| I <sub>BHH</sub> <sup>(8)</sup> | Bus Hold HIGH Current    | A or B Port                                         |                                                           |                                |      |                                 |      |      |
|                                 |                          | V <sub>I</sub> = 0.91V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 1.4V         | -15                            |      | -15                             |      | μA   |
|                                 |                          | V <sub>I</sub> = 1.07V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 1.65V        | -25                            |      | -25                             |      | μA   |
|                                 |                          | V <sub>I</sub> = 1.60V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 2.3V         | -45                            |      | -45                             |      | μA   |
|                                 |                          | V <sub>I</sub> = 2.00V                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub><br>= 3.3V         | -100                           |      | -100                            |      | μA   |

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|                     |                                          |                                              |                                                     |      |         |      |           |         |
|---------------------|------------------------------------------|----------------------------------------------|-----------------------------------------------------|------|---------|------|-----------|---------|
| $I_{BHLO}^{(8)(9)}$ | Bus Hold<br>LOW<br>Overdrive<br>Current  | A or B port                                  |                                                     |      |         |      |           |         |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 1.4V$               |                                                     | 125  |         | 125  |           | $\mu A$ |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 1.65V$              |                                                     | 200  |         | 200  |           | $\mu A$ |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 2.3V$               |                                                     | 300  |         | 300  |           | $\mu A$ |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 3.3V$               |                                                     | 500  |         | 500  |           | $\mu A$ |
| $I_{BHHO}^{(8)(9)}$ | Bus Hold<br>HIGH<br>Overdrive<br>Current | A or B port                                  |                                                     |      |         |      |           |         |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 1.4V$               |                                                     | -125 |         | -125 |           | $\mu A$ |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 1.65V$              |                                                     | -200 |         | -200 |           | $\mu A$ |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 2.3V$               |                                                     | -300 |         | -300 |           | $\mu A$ |
|                     |                                          | $V_{CC(A)} = V_{CC(B)} = 3.3V$               |                                                     | -500 |         | -500 |           | $\mu A$ |
| $I_{OZ}$            | Off-state<br>Output<br>Current           | A or B Port;<br>$V_O = 0V$ or<br>$V_{CCO}$ ; | $V_{CC(A)} = V_{CC(B)}$<br>$= 3.6V^{(6)(10)}$       |      | $\pm 5$ |      | $\pm 7.5$ | $\mu A$ |
| $I_{OFF}$           | Power-off<br>Leakage<br>Current          | A Port; $V_I$ or<br>$V_O = 0V$ to<br>3.6V;   | $V_{CC(A)} = 0V$ ;<br>$V_{CC(B)} = 0.8V$ to<br>3.6V |      | $\pm 5$ |      | $\pm 35$  | $\mu A$ |
|                     |                                          | B Port; $V_I$ or<br>$V_O = 0V$ to<br>3.6V;   | $V_{CC(B)} = 0V$ ;<br>$V_{CC(A)} = 0.8V$ to<br>3.6V |      | $\pm 5$ |      | $\pm 35$  |         |

**Note8:** '+/-' represents the direction of the current.

**Note9:**  $I_{BHL}$ ,  $I_{BHH}$  means the bus hold current;  $I_{BHLO}$ ,  $I_{BHHO}$  means the minimum overdrive current to flip the level.

**Note10:** For I/O ports, the parameter  $I_{OZ}$  includes the input leakage current.

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## Electrical Characteristics(continued)

| Symbol          | Parameter      | Conditions                                                                                                                                                                                             | T <sub>A</sub> = -40°C to 85°C |     | T <sub>A</sub> = -40°C to 125°C |      | Unit |
|-----------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----|---------------------------------|------|------|
|                 |                |                                                                                                                                                                                                        | Min                            | Max | Min                             | Max  |      |
| I <sub>CC</sub> | Supply Current | A Port; V <sub>I</sub> =0V or V <sub>CC(I)</sub> ;<br>I <sub>O</sub> =0A                                                                                                                               |                                |     |                                 |      |      |
|                 |                | V <sub>CC(A)</sub> = 0.8V to 3.6V;<br>V <sub>CC(B)</sub> = 0.8V to 3.6V                                                                                                                                |                                | 8   |                                 | 11.5 | μA   |
|                 |                | V <sub>CC(A)</sub> = 3.6V; V <sub>CC(B)</sub> = 0V                                                                                                                                                     |                                | 8   |                                 | 11.5 | μA   |
|                 |                | V <sub>CC(A)</sub> = 0V; V <sub>CC(B)</sub> = 3.6V                                                                                                                                                     | -2                             |     | -8                              |      | μA   |
|                 |                | B Port; V <sub>I</sub> = 0V or V <sub>CC(I)</sub> ;<br>I <sub>O</sub> =0A                                                                                                                              |                                |     |                                 |      |      |
|                 |                | V <sub>CC(A)</sub> = 0.8V to 3.6V;<br>V <sub>CC(B)</sub> = 0.8V to 3.6V                                                                                                                                |                                | 8   |                                 | 11.5 | μA   |
|                 |                | V <sub>CC(A)</sub> = 3.6V; V <sub>CC(B)</sub> = 0V                                                                                                                                                     | -2                             |     | -8                              |      | μA   |
|                 |                | V <sub>CC(A)</sub> = 0V; V <sub>CC(B)</sub> = 3.6V                                                                                                                                                     |                                | 8   |                                 | 11.5 | μA   |
|                 |                | A Plus B Port (I <sub>CC(A)</sub> + I <sub>CC(B)</sub> );<br>V <sub>I</sub> =0V or V <sub>CC(I)</sub> ; I <sub>O</sub> =0A;<br>V <sub>CC(A)</sub> = 0.8V to 3.6V;<br>V <sub>CC(B)</sub> = 0.8V to 3.6V |                                | 16  |                                 | 23   | μA   |

## Switching Characteristics

Typical power dissipation capacitance at V<sub>CC(A)</sub> = V<sub>CC(B)</sub> and T<sub>A</sub> = 25°C (unless otherwise noted)<sup>(11)(12)</sup>

| Symbol          | Parameter                     | Conditions                                              | V <sub>CC(A)</sub> = V <sub>CC(B)</sub> |      |      |      |      |      | Unit |
|-----------------|-------------------------------|---------------------------------------------------------|-----------------------------------------|------|------|------|------|------|------|
|                 |                               |                                                         | 0.8V                                    | 1.2V | 1.5V | 1.8V | 2.5V | 3.3V |      |
| C <sub>PD</sub> | Power Dissipation Capacitance | A Port:(Direction A to B);<br>B Port:(Direction B to A) | 1                                       | 2    | 2    | 2    | 2    | 2    | pF   |
|                 |                               | A Port:(Direction B to A);<br>B Port:(Direction A to B) | 9                                       | 11   | 11   | 12   | 14   | 17   | pF   |

**Note11:** C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs.

**Note12:** f<sub>i</sub> = 10MHz; V<sub>I</sub> = 0 to V<sub>CC</sub>; t<sub>r</sub> = t<sub>f</sub> = 1ns; C<sub>L</sub> = 0pF; R<sub>L</sub> = ∞Ω.

# ET74AVCH2T45

## Switching Characteristics (Continued)

Typical switching characteristics at  $V_{CC(A)} = 0.8V$  and  $T_A = 25^\circ C$  (unless otherwise noted)

For test circuit, see [Figure5](#); for wave forms, see [Figure3](#) and [Figure4](#)

| Symbol    | Parameter         | Conditions | $V_{CC(B)}$ |      |      |      | Unit |
|-----------|-------------------|------------|-------------|------|------|------|------|
|           |                   |            | 0.8         | 1.2V | 1.8V | 3.3V |      |
| $t_{pd}$  | Propagation Delay | A to B     | 15.8        | 8.4  | 8.0  | 9.5  | ns   |
|           |                   | B to A     | 15.8        | 12.7 | 12.2 | 11.8 | ns   |
| $t_{dis}$ | Disable Time      | DIR to A   | 23.6        | 23.6 | 23.6 | 23.6 | ns   |
|           |                   | DIR to B   | 20.6        | 15.6 | 12.7 | 11.6 | ns   |
| $t_{en}$  | Enable Time       | DIR to A   | 43.6        | 33.2 | 31   | 30.2 | ns   |
|           |                   | DIR to B   | 44.4        | 38.1 | 37.6 | 39.1 | ns   |

Typical switching characteristics at  $V_{CC(B)} = 0.8V$  and  $T_A = 25^\circ C$  (unless otherwise noted)

For test circuit, see [Figure5](#); for wave forms, see [Figure3](#) and [Figure4](#)

| Symbol    | Parameter         | Conditions | $V_{CC(A)}$ |      |      |      | Unit |
|-----------|-------------------|------------|-------------|------|------|------|------|
|           |                   |            | 0.8         | 1.2V | 1.8V | 3.3V |      |
| $t_{pd}$  | Propagation Delay | A to B     | 15.8        | 12.7 | 12.2 | 11.8 | ns   |
|           |                   | B to A     | 15.8        | 8.4  | 8.0  | 9.5  | ns   |
| $t_{dis}$ | Disable Time      | DIR to A   | 23.6        | 12.4 | 5.6  | 3.0  | ns   |
|           |                   | DIR to B   | 20.6        | 19.6 | 18.6 | 18.0 | ns   |
| $t_{en}$  | Enable Time       | DIR to A   | 43.6        | 34.6 | 31.0 | 30.2 | ns   |
|           |                   | DIR to B   | 44.4        | 27.8 | 22.4 | 20.0 | ns   |

# ET74AVCH2T45

## Switching Characteristics: -40°C~85°C (Continued) <sup>(13)(14)</sup>

| Symbol                              | Parameter         | Conditions | V <sub>CC(B)</sub> |      |              |      |             |      | Unit |
|-------------------------------------|-------------------|------------|--------------------|------|--------------|------|-------------|------|------|
|                                     |                   |            | 1.2V ± 0.1V        |      | 1.8V ± 0.15V |      | 3.3V ± 0.3V |      |      |
|                                     |                   |            | Min                | Max  | Min          | Max  | Min         | Max  |      |
| V <sub>CC(A)</sub> = 1.1V to 1.3V   |                   |            |                    |      |              |      |             |      |      |
| t <sub>pd</sub>                     | Propagation Delay | An to Bn   | 1.0                | 12.0 | 0.6          | 8.8  | 0.5         | 7.5  | ns   |
|                                     |                   | Bn to An   | 1.0                | 12.0 | 0.7          | 11.3 | 0.5         | 10.5 | ns   |
| t <sub>dis</sub>                    | Disable Time      | DIR to An  | 2.2                | 14.0 | 2.2          | 14.0 | 2.2         | 14.0 | ns   |
|                                     |                   | DIR to Bn  | 2.2                | 13.0 | 2.0          | 10.0 | 2.4         | 8.0  | ns   |
| t <sub>en</sub>                     | Enable Time       | DIR to An  | -                  | 35.0 | -            | 33.1 | -           | 31.1 | ns   |
|                                     |                   | DIR to Bn  | -                  | 34.0 | -            | 30.0 | -           | 29.5 | ns   |
| V <sub>CC(A)</sub> = 1.65V to 1.95V |                   |            |                    |      |              |      |             |      |      |
| t <sub>pd</sub>                     | Propagation Delay | An to Bn   | 0.5                | 11.3 | 0.5          | 7.5  | 0.5         | 6.5  | ns   |
|                                     |                   | Bn to An   | 0.5                | 10.0 | 0.5          | 7.5  | 0.5         | 7.1  | ns   |
| t <sub>dis</sub>                    | Disable Time      | DIR to An  | 1.6                | 10.0 | 1.6          | 10.0 | 1.6         | 10.0 | ns   |
|                                     |                   | DIR to Bn  | 2.0                | 11.0 | 1.4          | 8.0  | 1.5         | 6.0  | ns   |
| t <sub>en</sub>                     | Enable Time       | DIR to An  | -                  | 34.0 | -            | 32.1 | -           | 30.1 | ns   |
|                                     |                   | DIR to Bn  | -                  | 28.0 | -            | 26.0 | -           | 24.6 | ns   |
| V <sub>CC(A)</sub> = 3.0V to 3.6V   |                   |            |                    |      |              |      |             |      |      |
| t <sub>pd</sub>                     | Propagation Delay | An to Bn   | 0.5                | 9.8  | 0.5          | 7.1  | 0.5         | 5.0  | ns   |
|                                     |                   | Bn to An   | 0.5                | 7.8  | 0.5          | 6.5  | 0.5         | 5.0  | ns   |
| t <sub>dis</sub>                    | Disable Time      | DIR to An  | 1.5                | 6.0  | 1.5          | 6.0  | 1.5         | 6.0  | ns   |
|                                     |                   | DIR to Bn  | 1.7                | 9.0  | 0.6          | 7.0  | 1.7         | 5.5  | ns   |
| t <sub>en</sub>                     | Enable Time       | DIR to An  | -                  | 31.0 | -            | 28.0 | -           | 27.1 | ns   |
|                                     |                   | DIR to Bn  | -                  | 26.0 | -            | 24.0 | -           | 23.7 | ns   |

# ET74AVCH2T45

## Switching Characteristics: -40°C~125°C (Continued) <sup>(13)(14)</sup>

| Symbol                              | Parameter         | Conditions | V <sub>CC(B)</sub> |      |              |      |             |      | Unit |
|-------------------------------------|-------------------|------------|--------------------|------|--------------|------|-------------|------|------|
|                                     |                   |            | 1.2V ± 0.1V        |      | 1.8V ± 0.15V |      | 3.3V ± 0.3V |      |      |
|                                     |                   |            | Min                | Max  | Min          | Max  | Min         | Max  |      |
| V <sub>CC(A)</sub> = 1.1V to 1.3V   |                   |            |                    |      |              |      |             |      |      |
| t <sub>pd</sub>                     | Propagation Delay | An to Bn   | 1.0                | 12.0 | 0.6          | 8.8  | 0.5         | 7.5  | ns   |
|                                     |                   | Bn to An   | 1.0                | 12.0 | 0.7          | 11.3 | 0.5         | 10.5 | ns   |
| t <sub>dis</sub>                    | Disable Time      | DIR to An  | 2.2                | 14.9 | 2.2          | 14.9 | 2.2         | 14.9 | ns   |
|                                     |                   | DIR to Bn  | 2.2                | 13.9 | 2.0          | 10.9 | 2.4         | 8.9  | ns   |
| t <sub>en</sub>                     | Enable Time       | DIR to An  | -                  | 35.9 | -            | 33.9 | -           | 31.9 | ns   |
|                                     |                   | DIR to Bn  | -                  | 34.9 | -            | 30.9 | -           | 30.2 | ns   |
| V <sub>CC(A)</sub> = 1.65V to 1.95V |                   |            |                    |      |              |      |             |      |      |
| t <sub>pd</sub>                     | Propagation Delay | An to Bn   | 0.5                | 11.3 | 0.5          | 7.5  | 0.5         | 6.5  | ns   |
|                                     |                   | Bn to An   | 0.5                | 10.0 | 0.5          | 7.5  | 0.5         | 7.1  | ns   |
| t <sub>dis</sub>                    | Disable Time      | DIR to An  | 1.6                | 10.9 | 1.6          | 10.9 | 1.6         | 10.9 | ns   |
|                                     |                   | DIR to Bn  | 1.8                | 11.9 | 1.4          | 8.9  | 1.5         | 6.9  | ns   |
| t <sub>en</sub>                     | Enable Time       | DIR to An  | -                  | 34.9 | -            | 32.9 | -           | 30.9 | ns   |
|                                     |                   | DIR to Bn  | -                  | 28.9 | -            | 26.9 | -           | 25.4 | ns   |
| V <sub>CC(A)</sub> = 3.0V to 3.6V   |                   |            |                    |      |              |      |             |      |      |
| t <sub>pd</sub>                     | Propagation Delay | An to Bn   | 0.5                | 9.8  | 0.5          | 7.1  | 0.5         | 5.0  | ns   |
|                                     |                   | Bn to An   | 0.5                | 7.8  | 0.5          | 6.5  | 0.5         | 5.0  | ns   |
| t <sub>dis</sub>                    | Disable Time      | DIR to An  | 1.5                | 6.9  | 1.5          | 6.9  | 1.5         | 6.9  | ns   |
|                                     |                   | DIR to Bn  | 1.7                | 9.9  | 0.6          | 7.9  | 1.7         | 6.4  | ns   |
| t <sub>en</sub>                     | Enable Time       | DIR to An  | -                  | 31.9 | -            | 28.9 | -           | 27.9 | ns   |
|                                     |                   | DIR to Bn  | -                  | 26.9 | -            | 24.9 | -           | 24.1 | ns   |

**Note13:**  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ ;  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ ;  $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .

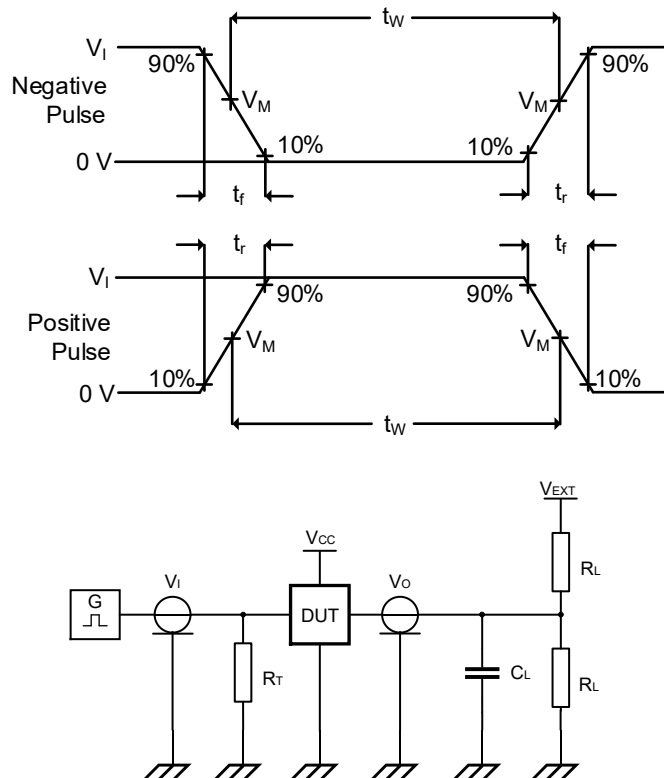
**Note14:** When testing  $t_{en}$ , the An or Bn port needs to change its state after the Bn or An port has changed. When testing  $t_{dis}$ , the An or Bn port does not rely on the output state change of the other port to change.



# ET74AVCH2T45

Table 1. Measurement Points

| Supply Voltage         | Input                | Output               |                  |                  |
|------------------------|----------------------|----------------------|------------------|------------------|
| $V_{CC(A)}, V_{CC(B)}$ | $V_M$                | $V_M$                | $V_X$            | $V_Y$            |
| 0.8V to 1.6V           | $0.5 \times V_{CCI}$ | $0.5 \times V_{CCO}$ | $V_{OL} + 0.1V$  | $V_{OH} - 0.1V$  |
| 1.65V to 2.7V          | $0.5 \times V_{CCI}$ | $0.5 \times V_{CCO}$ | $V_{OL} + 0.15V$ | $V_{OH} - 0.15V$ |
| 3.0V to 3.6V           | $0.5 \times V_{CCI}$ | $0.5 \times V_{CCO}$ | $V_{OL} + 0.3V$  | $V_{OH} - 0.3V$  |



Measurement points are given in [Table 2](#).

Definitions test circuit:

$R_L$  = Load resistance;

$C_L$  = Load capacitance including jig and probe capacitance;

$R_T$  = Termination resistance should be equal to output impedance  $Z_O$  of the pulse generator;

$V_{EXT}$  = External voltage for measuring switching times.

Figure5. Test circuit for measuring switching times

# ET74AVCH2T45

Table 2. Test Data

| Supply Voltage                          | Input            |                            | Load           |                | V <sub>EXT</sub>                    |                                     |                                     |
|-----------------------------------------|------------------|----------------------------|----------------|----------------|-------------------------------------|-------------------------------------|-------------------------------------|
| V <sub>CC(A)</sub> , V <sub>CC(B)</sub> | V <sub>I</sub>   | $\Delta t/\Delta V^{(15)}$ | C <sub>L</sub> | R <sub>L</sub> | t <sub>PLH</sub> , t <sub>PHL</sub> | t <sub>PZH</sub> , t <sub>PHZ</sub> | t <sub>PZL</sub> , t <sub>PLZ</sub> |
| 0.8V to 1.6V                            | V <sub>CCI</sub> | $\leq 1.0\text{ns/V}$      | 15pF           | 2k $\Omega$    | Open                                | GND                                 | 2 × V <sub>CCO</sub>                |
| 1.65V to 2.7V                           | V <sub>CCI</sub> | $\leq 1.0\text{ns/V}$      | 15pF           | 2k $\Omega$    | Open                                | GND                                 | 2 × V <sub>CCO</sub>                |
| 3.0V to 3.6V                            | V <sub>CCI</sub> | $\leq 1.0\text{ns/V}$      | 15pF           | 2k $\Omega$    | Open                                | GND                                 | 2 × V <sub>CCO</sub>                |

**Note15:** dV/dt ≥ 1.0V/ns

## Application Circuits

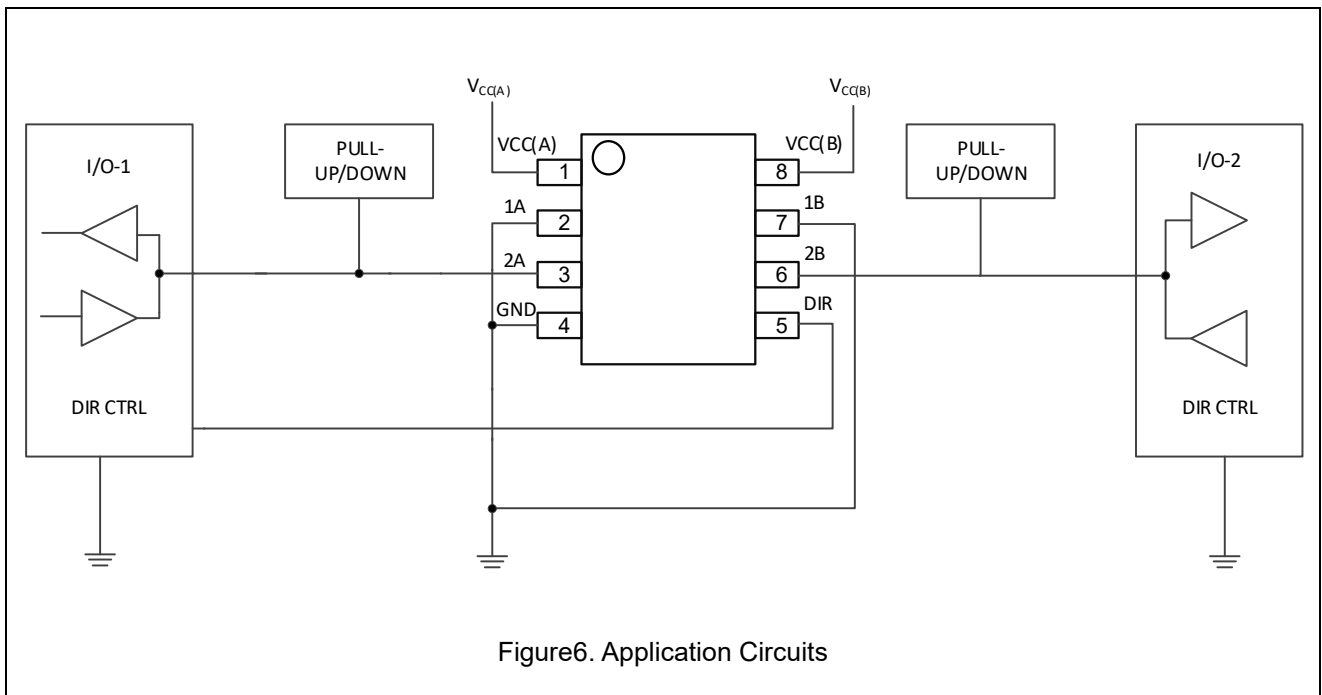
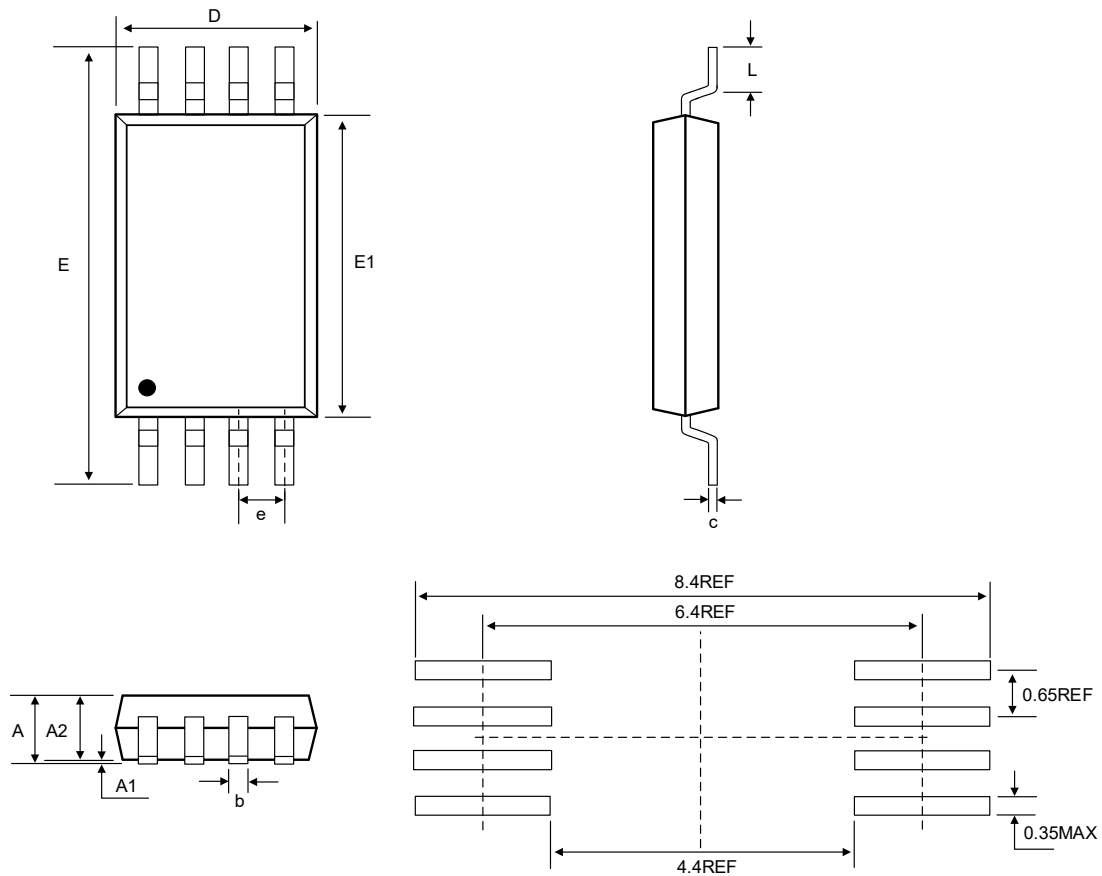


Figure6. Application Circuits

# ET74AVCH2T45

## Package Dimension

TSSOP8(4.4mm × 2.95mm)



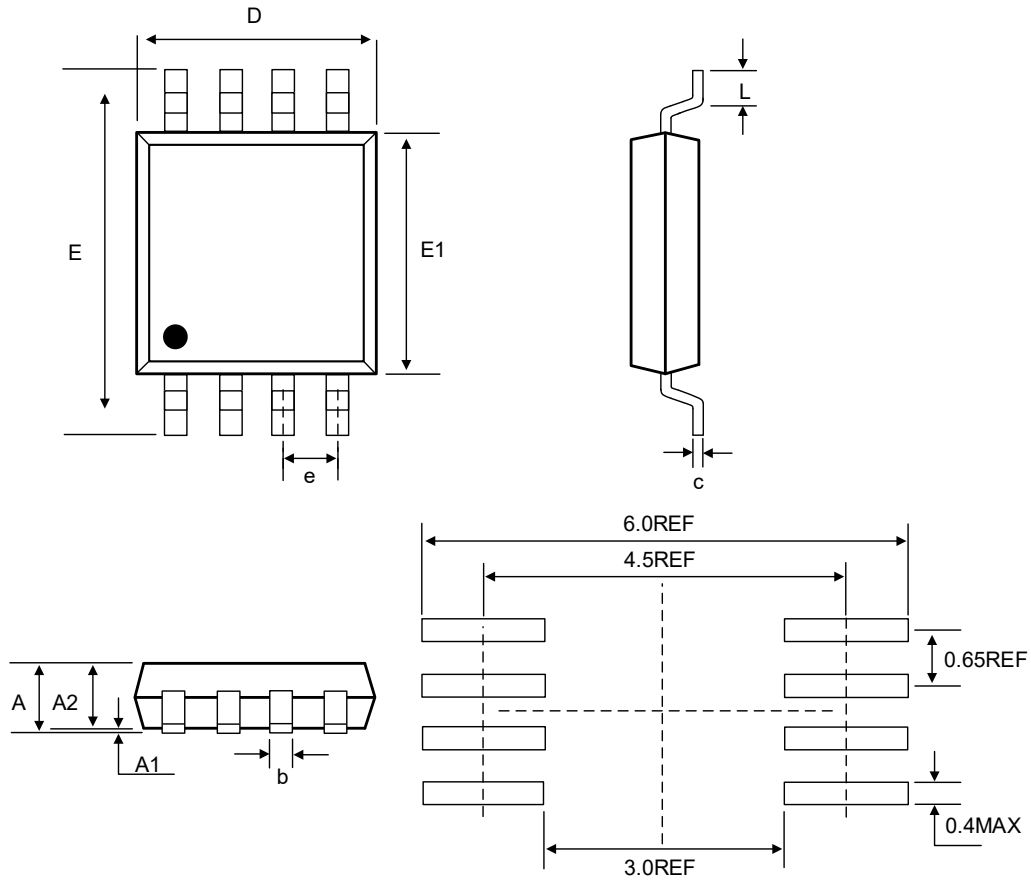
## COMMON DIMENSIONS

(Unit: mm)

| SYMBOL | MIN     | NOM  | MAX  |
|--------|---------|------|------|
| A      | -       | -    | 1.25 |
| A1     | 0.00    | -    | 0.15 |
| A2     | 0.80    | 0.95 | 1.10 |
| b      | 0.19    | -    | 0.30 |
| c      | 0.08    | -    | 0.20 |
| D      | 2.80    | 2.95 | 3.10 |
| E      | 6.20    | 6.40 | 6.60 |
| E1     | 4.30    | 4.40 | 4.50 |
| e      | 0.65BSC |      |      |
| L      | 0.33    | -    | 0.75 |

# ET74AVCH2T45

MSOP8(3.0mm × 3.0mm)



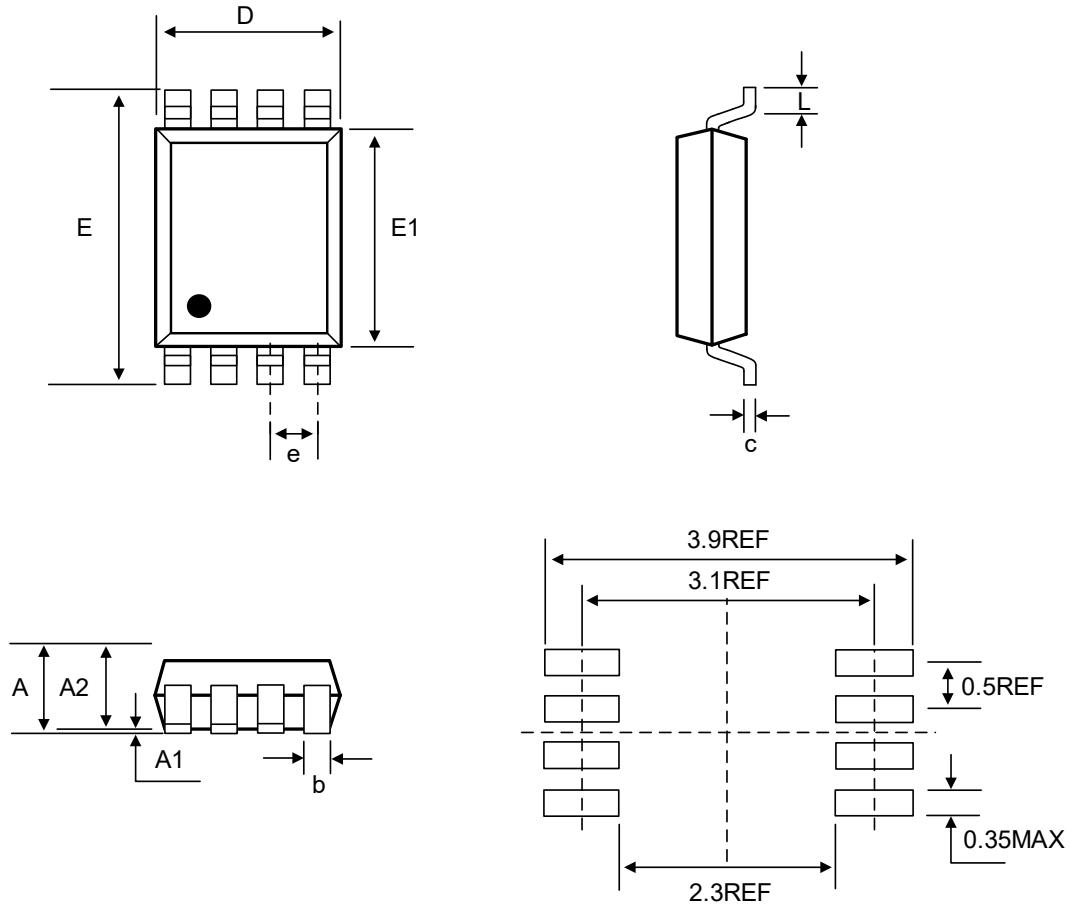
## COMMON DIMENSIONS

(Unit: mm)

| SYMBOL | MIN     | NOM  | MAX  |
|--------|---------|------|------|
| A      | -       | -    | 1.10 |
| A1     | 0.00    | -    | 0.15 |
| A2     | 0.75    | 0.85 | 0.95 |
| b      | 0.22    | 0.30 | 0.38 |
| c      | 0.08    | 0.1  | 0.20 |
| D      | 2.90    | 3.00 | 3.10 |
| E      | 3.90    | -    | 5.10 |
| E1     | 2.90    | 3.00 | 3.10 |
| e      | 0.65BSC |      |      |
| L      | 0.33    | -    | 0.7  |

# ET74AVCH2T45

VSSOP8(2.0mm × 2.3mm)



## COMMON DIMENSIONS

(Unit: mm)

| SYMBOL | MIN     | NOM  | MAX  |
|--------|---------|------|------|
| A      | -       | -    | 0.90 |
| A1     | 0.00    | -    | 0.10 |
| A2     | 0.65    | 0.75 | 0.80 |
| b      | 0.17    | -    | 0.27 |
| c      | 0.08    | -    | 0.20 |
| D      | 1.90    | 2.00 | 2.10 |
| E      | 3.00    | 3.10 | 3.20 |
| E1     | 2.20    | 2.30 | 2.40 |
| e      | 0.50BSC |      |      |
| L      | 0.20    | -    | 0.35 |

# ET74AVCH2T45

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**Revision History and Checking Table**

| Version | Date       | Revision Item               | Modifier   | Function &<br>Spec Checking | Package &<br>Tape Checking |
|---------|------------|-----------------------------|------------|-----------------------------|----------------------------|
| 0.0     | 2024-11-3  | Preliminary Version         | Licheng    | Tugz                        | Liujiy                     |
| 1.0     | 2025-03-20 | Official Version            | Wanganran  | Yangxiaoxu                  | Liujiy                     |
| 1.1     | 2025-05-14 | Update EC Table             | Wanganran  | Yangxiaoxu                  | Liujiy                     |
| 1.1.a   | 2025-09-24 | Update Package              | Yangxiaoxu | Yangxiaoxu                  | Liujiy                     |
| 1.2     | 2025-10-20 | Update Format               | Wanganran  | Yangxiaoxu                  | Liujiy                     |
| 1.3     | 2025-10-24 | Add MSOP8 TSSOP8<br>Package | Yangxiaoxu | Yangxiaoxu                  | Liujiy                     |